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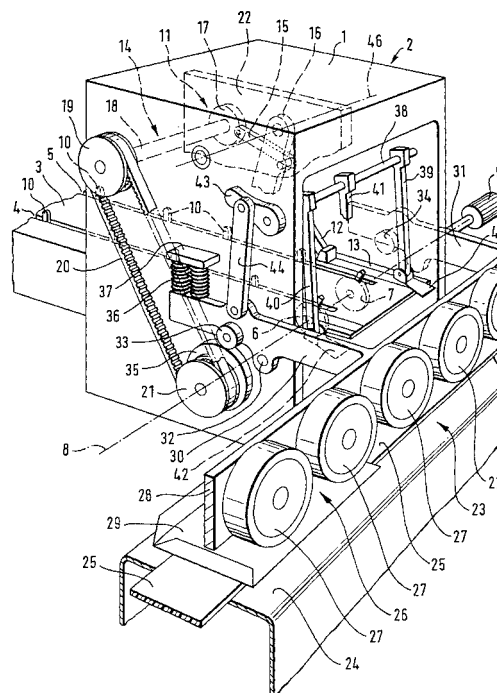
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(54) **Mail-processing machine**

(57) In the case of a mail-processing machine, a straightforward construction of the drive for the different machine parts is achieved in that the upwardly and downwardly directed pivoting movements of a pivoting-arm arrangement (30,31), on which a pressure-exerting roller bar (26) interacting with an envelope-conveying belt (25) is retained, are transmitted, via a coupling rod and an actuating lever, to a pivoting shaft on which a pivoting-lever arrangement is located, the bottom ends of the latter bearing spring-loaded auxiliary push-in fingers (10). Since the actuating movements of the pivoting-arm arrangement are produced by cams seated on a drive shaft, and this drive shaft also bears the chain wheels for driving a conveying-chain arrangement by means of which enclosures or sets of enclosures which are to be inserted into envelopes are delivered into the envelope-filling station perpendicularly to the running direction of the envelope-conveying belt, and this drive shaft is also in drive connection with a crank mechanism for the push-in arrangement, the drive systems as a whole can be simplified to a great extent.



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Description

[0001] The invention relates to a mail-processing machine according to the preamble of Claim 1.

[0002] Mail-processing machines of the type which is of interest here (DE 100 15 754 Cl) contain, in the envelope-filling station, a push-in arrangement in the case of which the drive stroke and the return stroke run parallel to the conveying direction of the conveying arrangement, a crank mechanism for actuating the push-in arrangement being in drive connection with the drive for the conveying arrangement.

[0003] An envelope-conveying arrangement delivers open envelopes over an envelope-filling station, transversely to the conveying direction of the conveying arrangement, into a position opposite the push-in arrangement. Also provided is an auxiliary push-in arrangement, which has spring-loaded auxiliary push-in fingers which are guided on a pivoting-lever arrangement mounted pivotably on the housing, which, coordinated with the operating cycle of the push-in arrangement, are introduced into the envelope opening before the operating stroke of the push-in arrangement ends, and beneath which enclosures or sets of enclosures are then pushed into the envelope opening by the push-in arrangement.

[0004] Mail-processing machines of this known and commercially available type of construction have comparatively complicated drive systems for actuating the conveying arrangement, i.e. for driving the conveying chains equipped with conveying fingers, for driving the push-in arrangement, for driving the envelope-conveying arrangement and for driving the auxiliary push-in arrangement.

[0005] The invention is intended to achieve the object of configuring a mail-processing machine having the features of the preamble of Claim 1 such that the drive system for this machine is simplified and the operating cycles of the drive are reliably coordinated even at high operating speeds.

[0006] This object is achieved according to the invention by a mail-processing machine having the features according to Patent Claim 1. Advantageous configurations and developments form the subject matter of the patent claims subordinate to Claim 1.

[0007] Preferred embodiments are explained in more detail hereinbelow with reference to the attached drawing, in which part of a mail-processing machine of the type specified here is illustrated schematically in perspective.

[0008] The mail-processing machine contains an envelope-filling station 2 which is accommodated in a box-like housing 1 and into which a conveying arrangement 3 runs. This conveying arrangement 3 contains a pair of parallel conveying chains 4 and 5 which are guided over chain wheels. Only the front chain wheels 6 and 7, arranged in the envelope-filling station 2, are indicated in the drawing, said chain wheels being seated on a com-

mon drive shaft, which is symbolized by the chain-dotted line 8 and is coupled to a drive motor 9.

[0009] The conveying chains 4 and 5 are equipped with the conveying fingers 10, conveying fingers 10 which are located one beside the other, in the region of the top strand of the conveying chains 45, each defining conveying compartments by means of which enclosures or sets of enclosures which are to be inserted into envelopes are conveyed up to the envelope-filling station 2. Sets of enclosures are put together, in the manner known to the person skilled in the art, by supply stations which are lined up along the conveying path of the conveying arrangement 3 and position individual enclosures in the conveying compartments.

[0010] Located in the housing 1 of the envelope-filling station 2 is a push-in arrangement 11 which has a pair of push-in fingers, which are mounted pivotably on a push-in-finger carrier and of which one is illustrated in the drawing at 12. In a return stroke of the push-in arrangement, the bottom ends of the push-in fingers 12, in relation to the position shown in the drawing, move to the left or rearwards, counter to the push-in direction, over a base plate 13 of the push-in arrangement. In the following operating stroke, the bottom ends of the push-in fingers 12 move forwards and overtake a pair of conveying fingers 10 with the trailing edges of enclosures or sets of enclosures butting against them. The bottom ends of the push-in fingers 12 position themselves against said trailing edges or borders of the sets of enclosures, push them away from the conveying fingers 10 and then push the entire set of enclosures into an envelope which is held ready in an open state, which will be discussed in more detail at a later stage in the text.

[0011] The push-in-finger carrier is caused to move back and forth over the base plate 13 of the push-in arrangement by a crank mechanism 14, which acts, via a connecting rod 15, on a link arrangement 16 which connects the push-in-finger carrier to a housing-mounted bearing means. Details of the link arrangement 16 and of the connection thereof to the push-in-finger carrier equipped with the push-in fingers 12 have been left out of the drawing in order to simplify the illustration.

[0012] The crank mechanism 14 at least contains a crank disc 17, which is connected to the connecting rod 15, a crank shaft 18 and a belt pulley 19, which is fastened on the crank shaft 18 outside the housing 1 and over which a drive belt 20 is positioned, the latter being routed to a further belt pulley 21, which is fastened on the drive shaft 8 such that the operating cycles of the push-in arrangement 11 are synchronized with the conveying speed of the conveying arrangement 3.

[0013] It should also be mentioned that an intermediate wall 22 is installed within the housing 1 of the envelope-filling station 2, in the top region, such that the crank shaft 18 can be guided by a bearing supported by the intermediate wall 22 and the crank disc 17 is fastened on the crank shaft 18 on that side of the interme-

diate wall 22 which is remote from the viewer.

[0014] Located in front of the outlet of the envelope-filling station 2 is an envelope-conveying arrangement 23 by means of which open envelopes can be conveyed up, transversely to the conveying direction of the conveying arrangement 3 and transversely to the push-in direction of the push-in arrangement 11, into a position in front of the push-in arrangement 11, the envelope opening is released in order for the envelope-filling material to be pushed in, and the filled envelopes are then conveyed away in the direction of the person viewing the figure of the drawing. The envelope-filling arrangement contains an envelope-filling table 24 which has the top strand of an envelope-conveying belt 25 guided over its surface. The envelope-conveying belt 25 is guided over rollers mounted in the envelope-conveying table 24, details in this respect as well as the bottom strand and the course taken by the latter in the envelope-filling table 24 having been left out in order to simplify the illustration.

[0015] Located above the envelope-conveying belt 25 is a roller bar 26 with a number of elastically compliant rollers 27 which have comparatively large diameters and, in the manner illustrated, are mounted in floating fashion on an elongate roller carrier 28. The roller carrier 28 and the rollers 27 mounted rotatably thereon can be pressed against the envelope-conveying belt 25, and raised off from the envelope-conveying belt 25, in coordination with the operating cycle of the push-in arrangement 11 such that, with the rollers 27 lowered onto the envelope-conveying belt 25, an envelope which is to be filled is clamped between the envelope-conveying belt 25 and the rollers 27 and is transported into a position in front of the push-in arrangement 11 when the envelope-conveying belt is driven. If the roller carrier 28 with the rollers 27 is then raised, the envelope, and in particular the opening thereof, is released for filling with the envelope-filling material. Thereafter, the roller carrier 28 with the rollers 27 is lowered again in the direction of the envelope-conveying belt 25 and a filled envelope is clamped between the envelope-conveying belt and the rollers 27 such that, when the envelope-conveying belt 25 is driven again, the filled envelope can then be conveyed away and moves into the position shown in the drawing at 29. The roller carrier 28 with the rollers 27 can then be raised again and the filled envelope 29 is then fed to an envelope-flap-closing arrangement, although details in this respect do not fall under the subject matter of the present invention.

[0016] For the purpose of moving the roller carrier 28 and the rollers 27 mounted thereon, use is made of an actuating mechanism which contains two pivoting arms 30 and 31 which are fixed to the roller carrier 28, in particular are attached integrally thereto. The pivoting arms 30 and 31 extend rearwards from the roller carrier 28 on both sides, outside the housing 1 of the envelope-filling station 2, and are mounted pivotably on the side walls of the housing, approximately in the centre of said walls

in each case, the mounting point of the pivoting arm 30 being indicated in the drawing at 32.

[0017] Located on each of the pivoting arms 30 and 31, on the side which is directed away from the roller carrier 28 in relation to the mounting point 32, is a respective follower roller 33, 34 which is mounted rotatably on the respective pivoting arm and is in contact with an associated cam 35 in each case, only the cam 35 which is directed towards the viewer, and interacts with the follower roller 33, being illustrated in the drawing. The two cams 35, interacting with the follower rollers 33 and 34 of the respective pivoting arms 30 and 31, are fastened, like the chain wheels 6 and 7 and the belt pulley 21, on the drive shaft 8.

[0018] Moreover, a set of compression springs 36 acts on that end of each of the pivoting arms 30 and 31 which is directed away from the roller carrier 28, said set of compression springs being supported in each case against a spring bearing 37 anchored on the relevant side wall of the housing. The set of compression springs 36 subjects the rear pivoting-arm end to loading in the downward direction and keeps the follower roller 33 or 34 in abutment against the associated cam 35. The cams 35 are profiled such that, in accordance with the cycle of sets of enclosures being conveyed up by the conveying fingers 10 and in accordance with the operating cycle of the push-in arrangement 11, the roller bar 26 is lowered and raised again and then lowered again in order for envelopes to be conveyed in front of the push-in arrangement 11, to be released there in order to be filled with envelope-filling material and then to be conveyed away again from the position in front of the push-in arrangement.

[0019] A pivoting shaft 38 is also mounted rotatably in the housing 1 of the envelope-filling station 2, in front of the push-in arrangement 11, a pivoting-lever arrangement with pivoting levers 39, 40 and 41 being fastened on said pivoting shaft within the housing 1. Of a central pivoting lever 41, only the top part is illustrated in the drawing. Located at the bottom ends of the pivoting levers 39, 40 and 41 are auxiliary push-in fingers 42 which are prestressed by spring means in the direction of the base plate 13 and, before the end of the operating stroke of the push-in fingers 12 of the push-in arrangement 11, by virtue of the pivoting shaft 38 being pivoted, are advanced in the direction of the opening of an envelope provided and are pushed into the opening, whereupon the push-in fingers 12 push the envelope-filling material, beneath the auxiliary push-in finger 42, into the envelope opening.

[0020] An actuating lever 43 is fastened on the pivoting shaft 38 outside the housing 1 of the envelope-filling station 2, and is connected to the rear end of the pivoting arm 30 via a coupling rod 44. The coupling rod 44 is thus articulated, on the one hand, on the actuating lever 43 and, on the other hand, at the rear end of the pivoting arm 30.

[0021] If an envelope is located, between the enve-

lopes-conveying belt 25 and some of the rollers 27, in a position in front of the push-in arrangement 11, and if the envelope opening is to be released in order for the envelope to be filled with the envelope-filling material, then, in this operation phase, a region of the cam 35 with a relatively small radius is rotated beneath the follower roller 33 and the set of compression springs 36 can then press the rear end of the pivoting arms 30 and 31 downwards, and the front end of the pivoting arms raises the roller carrier 28 and the rollers 27 mounted thereon. At the same time, the coupling rod 44 pulls the actuating lever 43 downwards, as a result of which the pivoting shaft 38 is pivoted and, as the roller bar 26 rises up, the pivoting levers 39, 40 and 41 swing in the anticlockwise direction, in relation to the position shown, and push the push-in fingers 42 into the envelope opening. By virtue of the constant radius of the cam 35, this position of the roller bar 26 and of the auxiliary push-in fingers 42 is maintained until, by virtue of continued rotation of the drive shaft 8, the crank mechanism 14 has finally actuated the push-in arrangement 11 and the push-in fingers 12 have pushed the envelope-filling material into the envelope opening. Thereafter, the operations of lowering the roller bar 26 and returning the auxiliary push-in arrangement as well as the return stroke of the push-in arrangement 11 take place.

[0022] Although not shown in the drawing, the drive motor 9 for the drive shaft 8 is connected to a control device which, when the envelope-filling station is switched off, brings the drive to a standstill whenever the drive shaft 8 is located in a position in which the roller bar 26 has been raised. An envelope which has not been stored properly can then easily be pulled out from between the envelope-conveying belt 25 and the rollers 27 by an operator.

[0023] According to a modification which is not shown in the drawing, it is possible for the pivoting shaft which is indicated in the drawing at 46, and on which a link 16 of the link arrangement of the push-in arrangement 11 is fastened, to be extended beyond that side wall of the housing 1 of the envelope-filling station 2 which is directed towards the viewer and to bear an actuating lever which has articulated at its free end a connecting rod of which the bottom end extends to a crank or crank disc which is fastened directly on the drive shaft 8. In this case, this crank or crank disc actuates the actuating lever, seated on the pivoting shaft 46, via the connecting rod in order to make the push-in fingers of the push-in arrangement 11 move back and forth. It is then possible for the belt pulleys 19 and 21, the drive belt 20, the crank shaft 18, the crank disc 17 and the connecting rod 15 of the embodiment in the drawing to be dispensed with, as a result of which the entire drive mechanism is further simplified.

[0024] It is thus possible to establish that the drive motor 9 drives and/or actuates the conveying chains 4 and 5 of the conveying arrangement 3 as well as the push-in arrangement 11 for moving the push-in fingers 12, al-

so the pivoting shaft 38 for moving the pivoting-lever arrangement 39, 40 and 41 of the auxiliary push-in arrangement and, finally, also the roller bar 25 retained on the pivoting arms 30 and 31. The operating movements of the abovementioned machine parts are thus positively synchronized and, once adjusted, are always coordinated with one another. It goes without saying that the means of securing the cams 35 on the drive shaft 8, the drive connection between the pivoting arms 30 and 31 and the pivoting shaft 38 of the auxiliary push-in arrangement and also the drive connection between the drive shaft 8 and the crank mechanism for actuating the push-in arrangement 11 are provided with adjustment means, although these are familiar to the person skilled in the art and thus need not be illustrated in detail in the drawing.

Claims

1. Mail-processing machine having

a conveying arrangement (3), which has a pair of parallel, circulating conveying belts or conveying chains (4, 5) which are guided over rollers or chain wheels (6, 7) and are equipped with conveying fingers (10) such that pairs of conveying fingers (10) running one beside the other each define conveying compartments by means of which enclosures or sets of enclosures which are to be inserted into envelopes are conveyed up to an envelope-filling station (2),

a drive shaft (8), which is connected to a drive (9), is located in the envelope-filling station (2) and on which two of the rollers or chain wheels (6, 7) located one beside the other are fastened,

a push-in arrangement (11), which is located in the envelope-filling station (2) and can be actuated in an operating stroke and a return stroke by means of a crank mechanism (18, 17, 15), the operating stroke and the return stroke running parallel to the conveying direction of the conveying arrangement (3) and the crank mechanism (18, 17, 15) being in drive connection with the drive shaft (8),

an envelope-conveying arrangement (23) for conveying open envelopes over an envelope-filling table (24), transversely to the conveying direction of the conveying arrangement (3), into a position opposite the push-in arrangement (11), having a driven envelope-conveying belt (25) which is guided over rollers and of which the top strand runs over the envelope-filling table (24), and having a roller bar (26) which is arranged above the top strand of the envelope-conveying belt (25) and is retained on a pivot-

ing-arm arrangement (30, 31) which is mounted on the housing (1) of the envelope-filling station (2), about a geometrical pivot axis parallel to the abovementioned drive shaft (8), such that the roller bar (26), for the purposes of feeding and removing envelopes, can be lowered in the direction of the envelope-conveying belt (25) relative to the push-in arrangement and, for the purpose of releasing the opening of an envelope conveyed in front of the push-in arrangement, can be raised, the pivoting-arm arrangement (30, 31) bearing a follower-roller arrangement (33, 34) which is in contact with a cam arrangement (35, 35), fastened on the drive shaft (8), for actuating the roller bar (26), an auxiliary push-in arrangement, which has spring-loaded auxiliary push-in fingers (42) which are guided on a pivoting-lever arrangement (39, 40, 41) mounted pivotably on the housing, which, coordinated with the operating cycle of the push-in arrangement (11), are introduced into the envelope opening before the end of the operating stroke of the push-in arrangement (11), and beneath which enclosures or sets of enclosures are then pushed into the envelope opening by the push-in arrangement (11),

characterized in that a coupling rod (44) extends from the pivoting-arm arrangement (30, 31) to an actuating lever (43), which is coupled to the pivoting-lever arrangement (39, 40, 41) of the auxiliary push-in arrangement for the purpose of actuating the same, the coupling rod (44) being articulated on an extension of a pivoting arm of the pivoting-arm arrangement (30, 31), said extension being oriented towards that side of the geometrical pivot axis of the pivoting-arm arrangement (30, 31) which is remote from the roller bar (26).

2. Mail-processing machine according to Claim 1, **characterized in that** a roller carrier (28) of the roller bar (26) is fixed to pivoting arms (30, 31) which are arranged on both sides of the housing (1) of the envelope-filling station (2), are mounted on said housing, form the pivoting-arm arrangement and each bear a follower roller (33, 34), each of these being assigned a cam (35) of the cam arrangement (35, 35), one cam (35) being fastened, on the drive shaft (8), on one side, and the other cam being fastened on the other side, of the housing (1) of the envelope-filling station (2).
3. Mail-processing machine according to either of Claims 1 and 2, **characterized in that**, for the purpose of actuating the push-in arrangement (11), the crank mechanism contains a belt pulley (21), which is fastened on the drive shaft (8), a housing-mount-

ed crank shaft (18), which is provided with a belt pulley (19), a drive belt (20), which is tensioned between the two belt pulleys, and a connecting rod (15), which is routed from the crank of the crank shaft (18) to a pivoting-lever arrangement (16) of the push-in arrangement (11).

4. Mail-processing machine according to either of Claims 1 and 2, **characterized in that**, for the purpose of actuating the push-in arrangement (11), the crank mechanism contains a crank or crank disc, which is fastened on the drive shaft (8), and a connecting rod, which is routed from said crank or crank disc to an actuating lever which is fixed to the pivoting-lever arrangement of the push-in arrangement (11).
5. Mail-processing machine according to one of Claims 1 to 4, **characterized in that** the cam arrangement (35, 35) and the follower-roller arrangement (33, 34) of the pivoting-arm arrangement (30, 31) are designed, in relation to the geometrical pivot axis thereof, such that the roller bar (26) is lowered when the follower-roller arrangement (33, 34) is raised by the cam arrangement (35, 35).
6. Mail-processing machine according to Claim 5, **characterized in that** the follower-roller arrangement (33, 34) is kept in abutment against the cam arrangement (35, 35) by spring means (36) acting on the pivoting-arm arrangement (30, 31).
7. Mail-processing machine according to one of Claims 1 to 6, **characterized in that** the drive (9), which is coupled to the drive shaft (8), is connected to a control device which, when the envelope-filling station (2) is switched off, brings the drive to a standstill when the drive shaft (8) is located in a position in which the roller bar (26) has been raised.

